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(19)

(54) IMPROVEMENTS IN OR RELATING TO PISTONS

(71) We, WELLWORTHY LIMITED, a British Company, of Lymington, Hampshire, England SO4 9YE, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:–

The present invention relates to light metal alloy pistons and, more particularly, to pistons having a recess in the piston crown, said recess being at least partly delimited by a member of a heat-resisting material which may be defined as any material which is more heat resistant than the light alloy from which the remainder of the piston is made (usually an aluminium alloy).

Many such inserts of heat-resisting material cannot be satisfactorily welded in position because of the difference between the material of the piston and the material of the insert. Typical heat-resisting materials include high conductivity alloys such as chromium-copper, copper-beryllium, copper-nickel, silicon bronzes or aluminium bronze but may also include very high temperature resisting nickel alloys, ferrous alloys or ceramics such as silicon nitride. It has been proposed hitherto to secure such inserts of heat-resisting material by screwing them into position but this does not provide a sufficiently secure and reliable fastening of the insert, which may become loose when the piston is subjected to high temperatures and stresses during its operation.

The invention consists in a light metal alloy piston comprising a heat-resisting insert which defines at least the periphery of a recess, for example a combustion chamber, provided in the piston crown, in which the insert is secured in a cavity in the piston crown by means of co-operating screw threads which are deformed at spaced regions, or are diffusion bonded, throughout the axial extent of the threads, thereby locking the insert in the crown by preventing unscrewing of the screw threads.

It is known to lock threads by physical deformation (i.e. peening) or by locally welding at the outer ends but this invention makes use of the deep penetration of electron beam welding or other similar welding, or of diffusion bonding, to lock the threads securely throughout their axial extent which is therefore much more secure than a surface deformation or weld which may be easily broken away.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:–

Fig. 1 is a sectional view of one embodiment of piston according to the present invention,

Fig. 2 is a plan view of the embodiment shown in Fig. 1 but on a smaller scale, and

Fig. 3 is a partial sectional view of a further embodiment.

Referring to Figs. 1 and 2, a light metal alloy, e.g. aluminium alloy, piston indicated generally at 1 has a crown 1*a* in which is fitted an annular insert 2 of heat-resisting material provided with a recess 3. The heat-resisting insert 2 has an outer threaded portion which is screwed directly into a cavity 5 in the piston crown 1*a*. The recess 3 may extend into the crown, as shown, or may be contained wholly within the insert. The co-operating threads 6*a* between the insert and the crown are deformed throughout their axial extents by welds produced by electron beam welding, at equispaced points around the insert. Four such points 8 are shown in Fig. 2, but more or less than four points may be welded. This deformation of the co-operating screws prevents the insert from being unscrewed and so locks the insert in the crown. It will be understood that the respective materials of the crown and insert may be such that fusion does not

occur and the welding beam only serves to deform the threads locally. Particularly when using a ceramic insert 2 it may be advantageous to retain this by means of a screwed-in metallic collar 9 which engages a peripheral flange 2*a* as shown in Fig. 3. The co-operating screw threads 6*a* are between the collar 9 and the crown 1*a*, as shown. In this case the screwed collar may again be locked by equispaced electron beam welds similar to those shown in Fig. 2.

It will be understood that various modifications may be made without departing from the scope of the invention. For example, the welds need not be equispaced. Instead of employing electron beam welding, other types of deep penetration welding could be employed. Alternatively, the co-operating screw threads may be diffusion bonded together.

WHAT WE CLAIM IS:–

1. A light metal alloy piston comprising a heat-resisting insert which defines at least the periphery of a recess provided in the piston crown, in which the insert is secured in a cavity in the piston crown by means of co-operating screw threads which are deformed at spaced regions or are diffusion bonded, throughout the axial extent of the threads, thereby locking the insert in the crown by preventing unscrewing of the screw threads.

2. A piston as claimed in claim 1, wherein the insert is a metallic insert screw-threaded into the cavity.

3. A piston as claimed in claim 1, wherein the insert is a non-metallic insert which is retained by means of a metallic collar screw-threaded into the cavity.

4. A piston as claimed in claim 3, wherein the collar engages a peripheral flange on said insert.

5. A piston as claimed in any of the preceding claims, wherein the co-operating screw threads are deformed by electron beam welding at spaced points around the co-operating screw threads.

6. A light metal alloy piston substantially as hereinbefore described with reference to Figs. 1 and 2, or Fig. 3 of the accompanying drawings.

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1542230 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

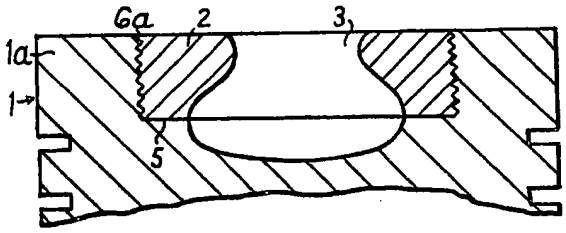

Fig.1

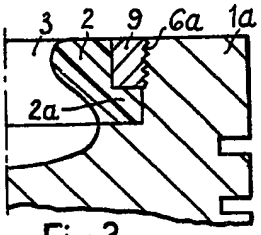

Fig.3

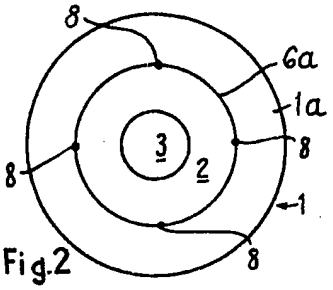

Fig.2